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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/774,883	02/09/2004	Ryan Fung	ALT.P027 (A1182)	8816

27296 7590 02/23/2006

LAWRENCE M. CHO
P.O. BOX 2144
CHAMPAIGN, IL 61825

EXAMINER	
KIK, PHALLAKA	

ART UNIT	PAPER NUMBER
2825	

DATE MAILED: 02/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/774,883	FUNG ET AL.	
	Examiner	Art Unit	
	Phallaka Kik	2825	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-71* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-71* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action responds to the Application filed on 2/9/2004. Claims 1-71 are pending.

Claim Objections

2. **Claims 6-7,10-13,15-17,21,23-25,27-28,32-44,61,65-71** are objected to because of the following informalities:

As per **claim 6**, "is" (line 1) should be --are-- for proper grammar.

As per **claim 7**, "weighting is" (line 1) should be --weightings are-- for proper antecedent basis and for proper grammar; --before-- should be inserted before "all" (line 2) for greater clarification.

As per **claim 10**, "is" (line 1) should be --are-- for proper grammar.

As per **claim 11**, "weighting is" (line 1) should be --weightings are-- for proper antecedent basis and for proper grammar; --before-- should be inserted before "all" (line 2) for greater clarification; "slack is" (line 2) should be --slacks are-- for proper grammar and for greater clarification.

As per **claim 12**, --the-- should be inserted before "minimum" (line 1) to clearly refer back to the "minimum delay budgets" recited in claim 1, from which the claim depends.

As per **claim 13**, "respects" (line 2) should be --comprises generating-- for greater clarification.

As per **claim 15**, "slack" (line 2) should be --slacks-- since there are positive slack and negative slack .

As per **claim 16**, "slack" (line 1) should be --slacks-- for proper antecedent basis to conform to the suggested correction in claim 15, from which the claim depends; "relaxationcomprises" (line 2) should be --relaxation comprises-- to provide for proper spacing between words.

As per **claim 17**, --.-- (period) should be inserted at the end of the sentence (line 3).

As per **claim 21**, "respects" (line 2) should be --comprises generating-- for greater clarification.

As per **claim 23**, "slack" (line 2) should be --slacks-- since there are positive slack and negative slack.

As per **claims 24-25**, "slack" (line 1) should be --slacks-- for proper antecedent basis due to the correction suggested in claim 23, from which the claims depend.

As per **claim 27**, "involves" (line 2) should be deleted for greater clarification.

As per **claim 28**, --further-- should be inserted before "comprises" to clearly identify the further limitation.

As per **claim 32**, "is" (line 1) should be --are-- for proper grammar.

As per **claim 33**, "weighting is" (line 1) should be --weightings are-- for proper antecedent basis and for proper grammar; --before-- should be inserted before "all" (line 2) for greater clarification.

As per **claim 37**, "is" (line 1) should be --are-- for proper grammar.

As per **claim 38**, "weighting is" (line 1) should be --weightings are-- for proper antecedent basis and for proper grammar; --before-- should be inserted before "all" (line

2) for greater clarification; "slack is" (line 2) should be --slacks are-- for greater clarification.

As per **claim 41**, "algorithm" (line 1) should be --method-- for proper antecedent basis; "re-determine" (line 3) should be --re-generate-- for proper antecedent basis.

As per **claim 42**, "the maximum" (line 1) should be --a maximum--; "determined" (line 2) should be --generated--; "the minimum" (line 2) should be --a minimum--; "determined for the" (line 2) should be --determined for a-- for proper antecedent basis.

As per **claim 43**, "the minimum" (line 1) should be --minimum-- since "the minimum and maximum delay budgets" would imply the budgets recited in claim 26 for "the connections" and not necessarily for "each connection" as recited in the claim.

As per **claim 44**, "algorithm" (line 1) should be --method--; "the distance" (line 2) should be --a distance-- for proper antecedent basis.

As per **claim 61**, "slack" (line 3) should be --slacks-- since there are short-path slack and long-path slack.

As per **claim 65**, "slack" (line 2) should be --slacks-- for proper antecedent basis due to suggested correction in claim 61, from which the claim depends.

As per **claims 68-69**, "the final" (line 2) should be --a final--; "the quality" (line 2) should be --a quality-- for proper antecedent basis.

As per **claim 70**, "the minimum" (line 2) should be --a minimum-- and "the respective" (line 2) should be --a respective-- for proper antecedent basis.

As per **claim 71**, "the maximum" (line 2) should be --a minimum-- and "the respective" (line 2) should be --a respective-- for proper antecedent basis.

As per **claims 16-17,24-25,34-41,65-69**, the claims are also objected to for incorporating the above errors into the respective claims by claim dependency.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. **Claims 1-4,8,12-16,18-24,26-29,34,39-44,46-47,53-62,65,68-71** are rejected under 35 U.S.C. 102(b) as being anticipated by **Bennett et al.** (U.S. Patent No. 5,659,484).

As per **claims 1,18,26,59,70-71**, the short path and long path timing constraints are described in col. 13, line 5 to col. 14, line 2, wherein at least the PERIOD, FREQUENCY, MAXDELAY, MAXSKEW, and OFFSET constraints correspond to the long path timing constraints (see Applicant's specification, page 9, lines 20-21 and page 1, lines 16-19), and wherein at least the OFFSET/BEFORE, OFFSET IN/AFTER, OFFSET OUT/AFTER, OFFSET OUT/BEFORE, and BLOCK constraints correspond to the short-path timing constraints (see Applicant's specification, page 9, lines 21-23); wherein the minimum and maximum delay budgets generated based on these timing constraints are further described in col. 18, line 1 to col. 19, line 61; and wherein such designing of the system based on the minimum/maximum delay budgets are part of the

placement and routing algorithms used which applied these delay budgets (see col. 26, line 53 to col. 30, line 20; see also col. 10, line 48 to col. 11, line 32), wherein machine-readable medium having stored thereon sequences of instructions when executed by a processor, causes the processor to implement the recited steps are also part of the computer-implemented system as described in col. 9, line 39 to col. 10, line 12 (see also Fig. 8).

As per **claims 2-4,8,12,19-20,27-29,34,39-40,60-62,65**, all of the elements of claims 1,18,26,59, from which the respective claims depend, are discussed in the rejection of claims 1,18,26,59 above, wherein the generating of the minimum/maximum delay budgets comprising finding a set of connection delays that attempt to satisfy the short/long path timing constraints, allocating short/long path slack (values), determining short/long path slack values, fixing any short/long path timing constraint violations (i.e., by making sure the timing constraints are satisfied), are also described in col. 18, line 1 to col. 19, line 60.

As per **claims 13,21**, all of the elements of claims 1,18 from which the respective claims depend are discussed in the rejection of claims 1,18 above, wherein the delay budgets respects lower and upper limits on connection delay are part of the mintarget and maxtarget computations as described in col. 19, lines 30-61 (see also col. 18, line 1 to col. 19, line 30).

As per **claims 14,22,68-69**, all of the elements of claims 1,13,18,21 from which the respective claims depend are discussed in the rejection of claims 1,13,18,21 above, wherein the delay budgets being determined by starting with estimates of final

connection delays, and the upper and lower limits on connection delay being based on estimates of possible delays in the final system and/or values that improve the quality of the system being design, are within the scope of **Bennett et al.** since the delay budgets (i.e., as calculated from slack values) uses both delay calculator for determining actual delays from existing routing and delay predictor which determines the estimated delays (see col. 10, lines 55-65) and wherein the mintarget and maxtarget computations are repetitively refined to arrive at a final system or at values that improve the quality of the system being designed as described in col. 19, lines 30-61 (see also col. 18, line 1 to col. 19, line 30).

As per **claims 15-16,23-24**, all of the elements of claims 1,18 from which the respective claims depend are discussed in the rejection of claims 1,18 above, wherein the positive and negative slacks involving the timing analysis using successive-over-relaxation are also part of the target relaxation described in col. 19, line 63 to col. 21, line 66.

As per **claim 41**, all of the elements of claim 34, from which the claim depends, are discussed in the rejection of claim 34 above, wherein repetitions or iterations of performing timing analysis, allocating slacks, and determining minimum and maximum delay budgets are illustrated in Figs. 5a-5b, 6a-6c (see also col. 18, line 46 to col. 21, line 65).

As per **claims 42-44**, all of the elements of claim 26, from the claims depend, are discussed in the rejection of claim 26 above, wherein the maximum delay budget is greater or equal than the minimum delay budget, the minimum and maximum delay

budgets are determined in consideration of each other, and optimizing some function of the distance (i.e., range) of the minimum and maximum delay budgets, are also part of the determining the target delay values (i.e., mintarget and maxtarget) as described in col. 18, line 1 to col. 21, line 65, wherein target relaxation balances optimizes the range/distance between the minimum and maximum delay budgets as well as taking in consideration of each other, wherein by definition the maximum delay budget must be greater or equal than the minimum delay budget in order to satisfy the proper timing constraints.

As per **claims 46-47,53-58**, all of the elements of claim 26, from the claims depend, are discussed in the rejection of claim 26 above, wherein the generating of the placement and routing strategy in response to the maximum and minimum delay budgets are described in col. 26, line 52 to col. 30, line 25, wherein since the FPGA into which the circuit design is to be implemented, contains dedicated routing resources including buffers (see col. 8, lines 21-50), the use of placement and routing which involves the use of dedicated routing resources, placement distances, increasing/decreasing delays, using more or fewer routing resources, using slower or faster routing resources, using buffers to slow down or speed up routes, are also within the scope of the placement and routing that attempts to meet the desired delay budgets and timing constraints as further described in col. 10, line 35 to col. 11, line 27.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. **Claims 5-7,9-11,17,25,30-33,35-38,63-64,66-67** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Bennett et al.** (U.S. Patent No. 5,659,484) in view of **Frankle et al.** (U.S. Patent No. 5,521,837).

As per **claims 5-7,9-11,17,25,30-33,35-38,63-64,66-67**, **Bennett et al.** disclose all of the elements of claims 4,8,16,24,29,34,65 from which the respective claims depend. However, **Bennett et al.** fails to teach the steps of adding/subtracting the delay in response to the short-path slack values and connection weightings (including weightings determined by a unit weighting scheme and weighting based on how much delay can be added/subtracted before a practical limit is reached or all relevant violations are resolved or allocated). **Frankle et al.** teach the use of connection weightings and slack values as part of the adjustment (i.e., by adding or subtracting) of the upper and lower limits delay (col. 13, line 15 to col. 16, line 20) such that limits on connections with negative slack are adjusted own and those with positive slack are adjusted up; thus providing the most optimized limits to meet the tighter path constraints (col. 10, lines 40-50; col. 9, lines 48-63), wherein since Applicant's specification does not specifically define the "unit weighting scheme", the weight f(c) calculated by dividing by the max weights satisfy this criterion (see col. 15, lines 40-45). It would have been obvious to one of ordinary skilled in the art at the time of the invention to further

incorporate the use of connection weightings and slack values as part of the adjustment (i.e., by adding or subtracting) of the upper and lower limits delay as taught by **Frankle et al.** into the method/system of **Bennett et al.** because such incorporation would provide the most optimized delay limits (i.e., delay budgets) as taught by **Frankle et al.** while at the same time meeting the particular short/long paths timing constraints as taught by **Bennett et al.**.

7. **Claims 45,48-52** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Bennett et al.** (U.S. Patent No. 5,659,484) in view of **Rostoker et al.** (U.S. Patent No. 5,541,849).

As per **claims 45,48-52**, **Bennett et al.** disclose all of the elements of claim 26, from which the claims depend. However, **Bennett et al.** failed to particularly teach the generating of a synthesis strategy in response to the maximum and minimum delay budgets, including whether to add or remove levels of logic, whether to use slower or faster variants of a functional block, whether to use faster or slower logic structures, and whether to use faster or slower logic inputs. **Rostoker et al.** a method/system for designing a circuit involving various levels of optimizations (see col. 9, line 60 to col. 12, line 23) including for ASICs and PLDs (see col. 48, line 61 to col. 49, line 4) which includes various synthesis strategies which take into consideration timing constraints, logic optimization (i.e., adding or removing levels of logic, using the particular functional block/logic structures/logic inputs, optimized for speed, area, or power) (see col. 10, line 63 to col. 11, line 2; col. 11, lines 18-45). It would have been obvious to one of ordinary skilled in the art at the time of the invention to further incorporate the various synthesis

strategies as taught by **Rostoker et al.** into the system/method of **Bennett et al.** because such incorporation would further optimize the resulting circuit design implementation as taught by **Rostoker et al.** while meeting the desired timing constraints as taught by **Bennett et al.**.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Therefore, Applicant is herein requested to consider them carefully in response to this Office Action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phallaka Kik whose telephone number is 571-272-1895. The examiner can normally be reached on Monday-Thursday, 6:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Chiang can be reached at 571-272-7483. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Any response to this action should be mailed to:

Commissioner for Patents

P. O. Box 1450

Alexandria, VA 22313-1450

or faxed to:

571-273-8300

Phallaka Kik
U.S. Patent Examiner
February 17, 2006